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Editorial

Editorial for Special Issue: "Current Status of Low-Grade Minerals and Mine Wastes Recovery: Reaction Mechanism, Mass Transfer, and Process Control"

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Mineral resources provide an important material foundation for industrial construction and are important for the economy, thus being closely integrated into our daily lives and near future [1,2]. However, mineral resources still possess limitations, such as low mineral grades and serious secondary/concomitant deposits [3]. This undesirable situation causes great difficulty in traditional underground/surface mining, increasing operational costs. In this regard, solution mining (heap leaching, in situ leaching, etc.) offers an environmentally friendly, low-cost, and efficient method for extracting these minerals, especially copper sulfides (chalcopyrite, chalcocite, etc.), sandstone uranium, and sandstone gold deposits. After years of development, solution mining has made great progress, but it has also encountered some technical bottlenecks.

To better understand the current status of low-grade mineral and mine waste recovery, we collected 13 contributions in this Special Issue, whose topics can be divided into the following three main aspects:

- **Section 1**: Reaction mechanisms of chemical/bio-leaching—includes the leaching kinetics of copper sulfides, assisted leaching (chloride acidic leaching, iodide-assisted leaching, etc.), in situ leaching of uranium and salt deposits, etc.
- **Section 2**: Process detection, characterization, and visualization—includes the detection of reaction products, the visualization of fluid flow and mass transfer, the pore structure characterization of leaching systems (ore-packed beds, etc.), microbial successions of leaching bacteria, etc.
- **Section 3**: Recovery, recycling, and reuse of mine wastes—includes cleaner leaching, disposal and production methods (dump leaching, etc.), the recovery of mine waste (waste rock, tailings, etc.), the assessment of operations problems, etc.

Section 1 includes one review paper and three research papers. Nkuma et al. reviewed the metals accessed from low-grade ores and the related environmental impact considerations and then carefully examined the benefits of conventional versus bioleaching strategies [4]. Dushyantha et al. presented a case of mine waste management related to the recovery potential of rare earth elements (REEs) from the gem mining waste of Sri Lanka [5]. Rakishev et al. sought to improve the efficiency of downhole uranium production using oxygen as an oxidizer [6]. Han et al. revealed the flocculation and settlement characteristics of ultrafine tailings and microscopic characteristics of flocs [7]. Section 2 includes four research papers. Alfonso et al. detected the process mineralogy of tailings from Llallagua and discussed the recovery potential of tin reserves [8]; Chen et al. studied the mineralogical characteristics of pegmatite tailings and performed a beneficiation assessment of pollucite in the recovery of cesium [9]; Wang L. et al. discussed hydrodynamic hysteresis and solute transport in agglomerated heaps under irrigation, stacking, and bioleaching

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control [10]. Stepwise irrigation also plays a key role in liquid retention. Thus, Wang L. et al. deepened our understanding of the effect of stepwise irrigation on the liquid holdup and hysteresis behaviors of unsaturated ore heaps [11]. In Section 3, there are two review paper and three research papers. Yang et al. reviewed the comprehensive utilization of magnesium slag and development prospects of preparing backfilling materials [12]. Similarly, Chen et al. reviewed the art of roof contacting in cemented waste backfill technology in a metal mine [13]. Wang J. et al. focused on mine waste disposal and backfilling technology, discussing the energy dissipation, AE characteristics, and microcrack evolution of rock–backfill composite materials (RBCM) [14], and the energy dissipation mechanism and damage constitutive model of roof–CPB–floor (RCF) layered composite materials were investigated [15]. Wang L. et al. evaluated the stope stability and displacement in a subsidence area using 3Dmine–Rhino3D–FLAC3D coupling [16].

The authors who contributed to this Special Issue represent more than 10 different institutions (including Monash University Malaysia, the University of South Africa, University of Moratuwa, General Research Institute of Nonferrous Metals, Henan Polytechnic University, Central South University, University of Science and Technology Beijing, etc.) in seven different countries (China, Kazakhstan, Malaysia, Spain, Bolivia, South Africa, Sri Lanka). We thank them for their academic contributions to this Special Issue.

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